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KWINIUK RIVER COUNTING TOWER PROJECT

1969

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Annual Technical Report

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KWINIUK RIVER COUNTING TOWER PROJECT, 1969

INTRODUCTION

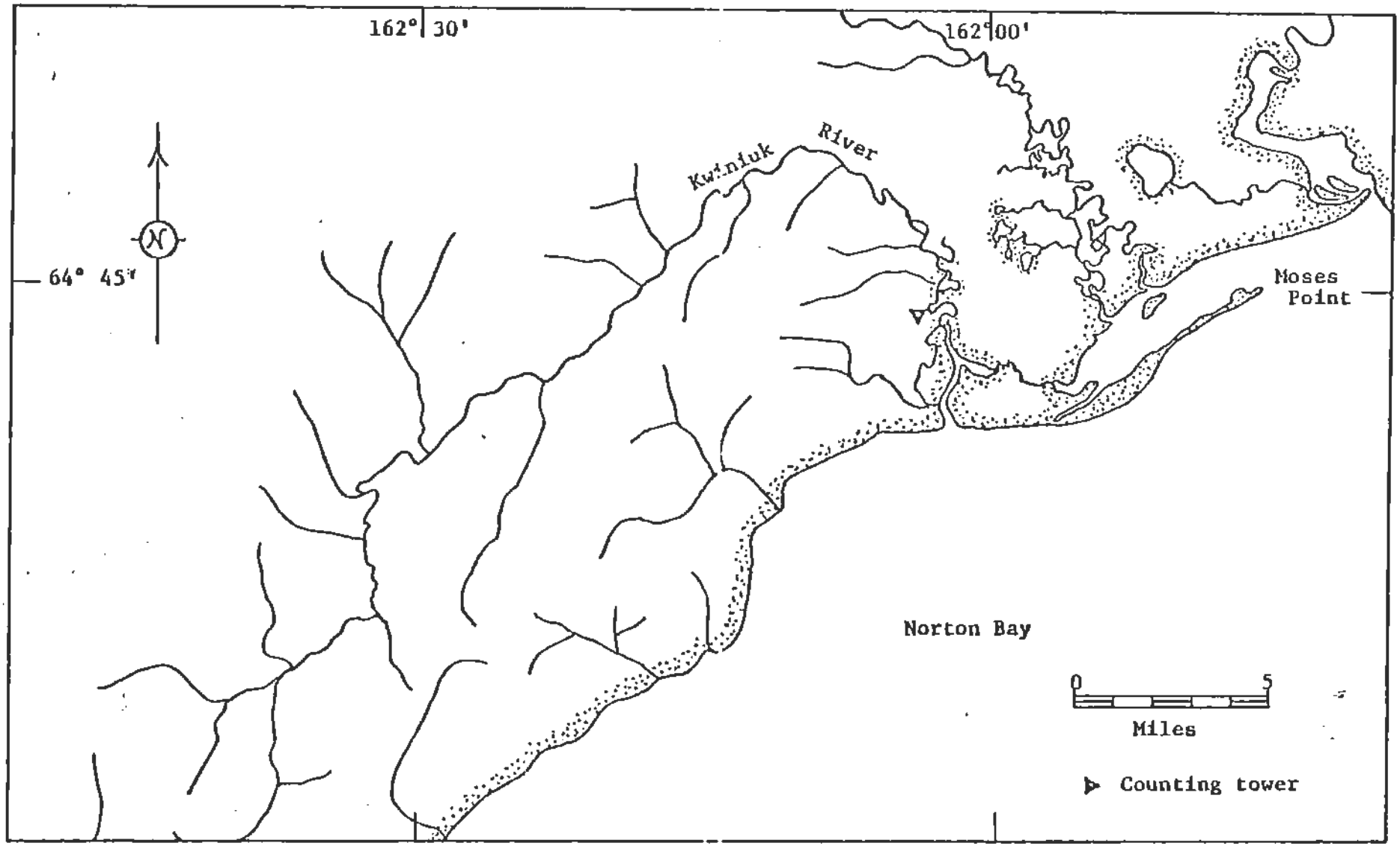
Since 1965, a counting tower project has been located on the Kwiniuk River, 110 miles east of Nome (Figure 5). The Kwiniuk River, similar to other major rivers in Norton Sound receives moderate runs of chum and pink salmon which are harvested by subsistence and commercial fisheries. To effectively manage the Norton Sound fisheries, it is important that frequent estimates of escapements during the season be obtained either by aerial survey methods or tower counts.

OBJECTIVES

The 1969 Kwiniuk River counting tower project objectives were to:

1. Obtain daily and seasonal timing and magnitude of salmon escapements.
2. Evaluate the accuracy of 10 minute salmon escapement counts as compared to hourly counts.
3. Evaluate aerial survey estimates as compared to counting tower enumeration of salmon escapements.
4. Observe behavior of salmon migrating past the counting tower.
5. Evaluate the feasibility of counting migrating salmon with the aidof artificial lighting.
6. Periodically sample the Moses Point commercial salmon fishery for age, sex and size information.

Figure 5. Map of the Kwiniuk River, Alaska



METHODS AND MATERIALS

A portable 20 foot aluminum counting tower was erected over a 30 foot high bank on the same location used since 1965 approximately five miles above the river mouth. A 25 fathom beach seine was used to block a secondary channel formed by a mid-river sand bar at the tower site.

A power line, with two 400 watt incandescent light bulbs, housed in 18 inch diameter reflectors, was strung across the main channel to provide illumination during dark or cloudy nights. A 1250 watt gasoline generator produced electric current for the lights.

A three man crew began 24 hour counting operations on June 26, and terminated operations on July 26. Each crew member counted salmon for two-four hour shifts daily. Hourly counts were broken down into 10 minute totals and hourly totals. If counts were missing for a time interval, escapements were determined by averaging the counts preceding and following that period. Salmon moving downstream were subtracted from the total count.

Aerial surveys were conducted from a chartered Cessna 180 aircraft. Inclement weather and logistic problems precluded more than one survey.

The commercial and subsistence fishery catches were periodically sampled for age, sex and size information at the river mouth.

RESULTS

Estimation of escapements from tower counts.

In 1969, a total of 19,749 chum 57,497 pink and 12 king salmon was counted past the tower. Daily and total escapements for 1969 are presented in Appendix F. The main peak of the chum run occurred during the period July 3-9, while the

peak of the pink run passed the tower during the period June 15-19 (Figure 6). All of the king salmon passed the tower before July 15.

The chum salmon escapement was the second lowest recorded since 1965 (Table 18). Of particular interest was the excellent escapement of 56,683 pink salmon; a 16-fold increase over the 1967 brood year escapement of only 3,508 fish. This was the second consecutive year of high pink salmon abundance recorded in the system.

Estimate of total seasonal escapement by 10 minute counts

The migration pattern of chum and pink salmon past the tower in 1969 as estimated by 10 minute counts appeared to be comparable to hourly timing. Relative errors of the total season's expanded 10 minute counts versus actual hour counts were calculated to be +2.9 percent for chums and -12.2 percent for pinks. Previous years data indicates a wider range and magnitude of relative error (Table 19).

Reliability of this method is questionable since it is dependent on daily migration timing. It becomes apparent that continous 24 hour counts per day are essential to obtain reliable estimates of both the daily and total seasonal escapements.

Aerial survey estimates compared to tower counts

An aerial survey of the entire Kwiniuk River was conducted July 9, 1969. A total of 18,524 salmon was enumerated and included 8,567 chums, 4,990 pinks, 2 kings and 4,965 unidentified small salmon. The cumulative tower count, up to and including July 8, was 10,568 chum, 8,683 pink and 12 king salmon. Comparative species ratios of identified chum and pink salmon for both tower counts and aerial survey estimates were 1.7:1 and 1.2:1 respectively. The aerial survey

Figure 6. Daily migration patterns of chum and pink salmon, Kwiniuk River, 1969.

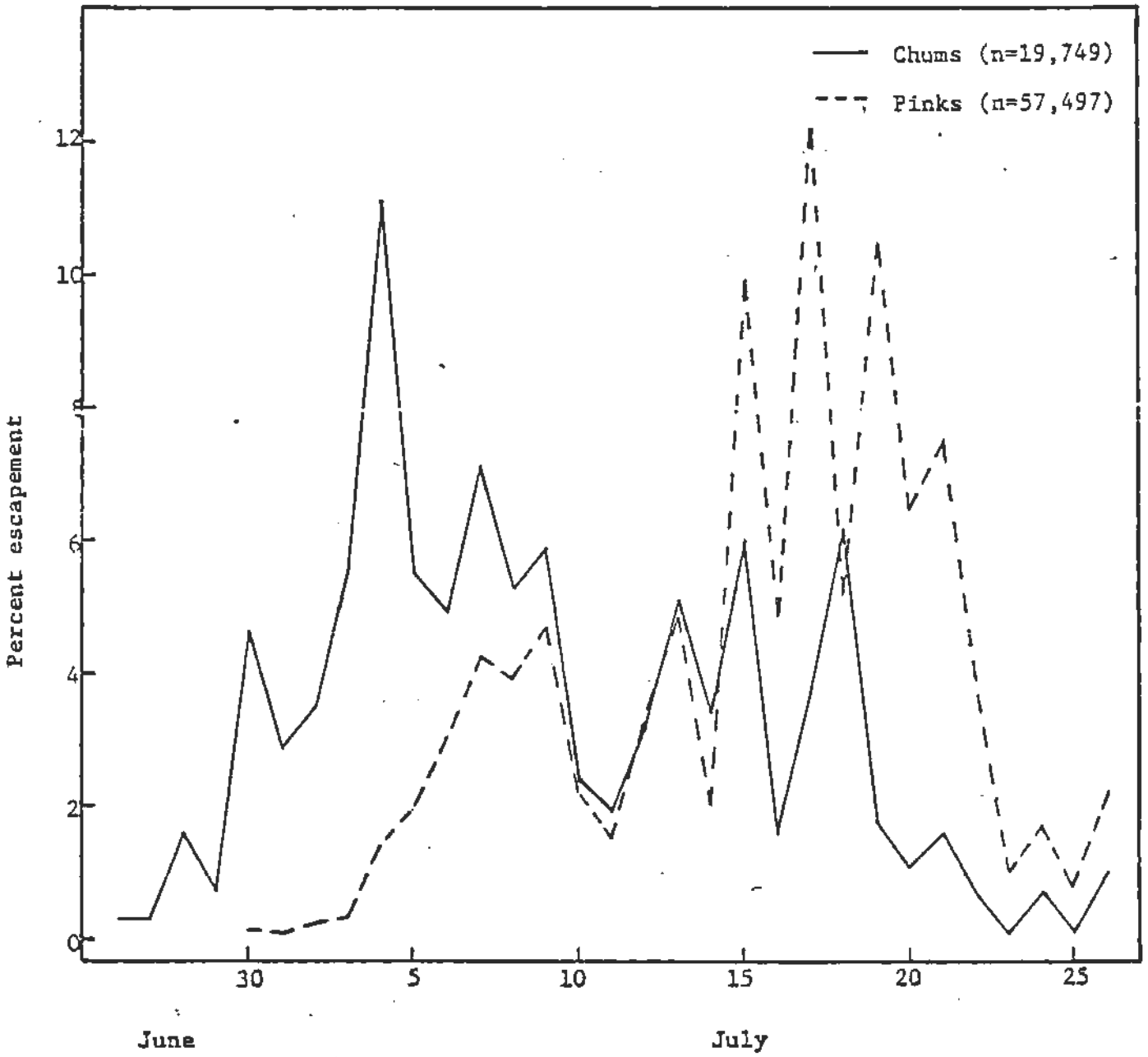


Table 18. Chum and pink salmon escapements[1/], Kwiniuk River, 1965-1969.

Species	1965	1966	1967	1968	1969
Chum	26,634	32,786	24,444	18,813	19,687
Pink	8,301	10,629	3,508	126,764	56,683

1/ Tower count minus upriver subsistence catch.

Table 19. Estimate of total chum and pink salmon seasonal escapements by 10 minute counts, Kwiniuk River, 1966-1969.

Species	Total 24 hour counts	Total expanded 10 minute counts	Percent relative error
		1966	
Chum	27,261	29,692	+8.9
Pink	10,138	10,770	+6.2
		1967	
Chum	26,520	26,100	-1.6
Pink	3,397	2,982	-12.2
		1968	
Chum	18,976	13,470	
Pink	129,052	104,880	-29.0 -18.7
		1969	
Chum	19,749	20,310	+2.8
Pink	57,497	50,508	-12.2

estimate was 96.2 percent of the accumulated tower count. The survey was conducted by an experienced observer and pilot. Results are presented in Table 20.

Observations of salmon behavior

In 1969, water levels in the Kwiniuk River were, for the most part, unusually low and clear. Salmon moving past the tower were easily observed, and similar to previous years, migrated primarily during the mid-afternoon to early morning hours (Figure 7). The artificial light suspended across the river, nor the vibrations from the generator seemed to affect fish movement past the tower. Artificial lighting greatly enhanced counting during periods of subdued natural light.

Age, sex and size composition of salmon

A total of 1,190 chum and 139 pink salmon samples was collected from the Moses Point commercial fishery for age, sex and size information. All fish scales were interpreted for age and data tabulated. Results are pending receipt of Department computer analysis.

DISCUSSION AND FUTURE PLANS

During the past five years, 1965-1969, this project has been of immense value in providing day-to-day information on the timing and trends in the size of the chum and pink salmon runs. The data has been especially useful toward management of the Norton Sound fisheries since the Kwiniuk River is considered to be typical of the salmon spawning streams located in Norton Sound.

Table 20. Estimate of salmon escapements by counting tower and aerial survey methods, Kwiniuk River, 1969.

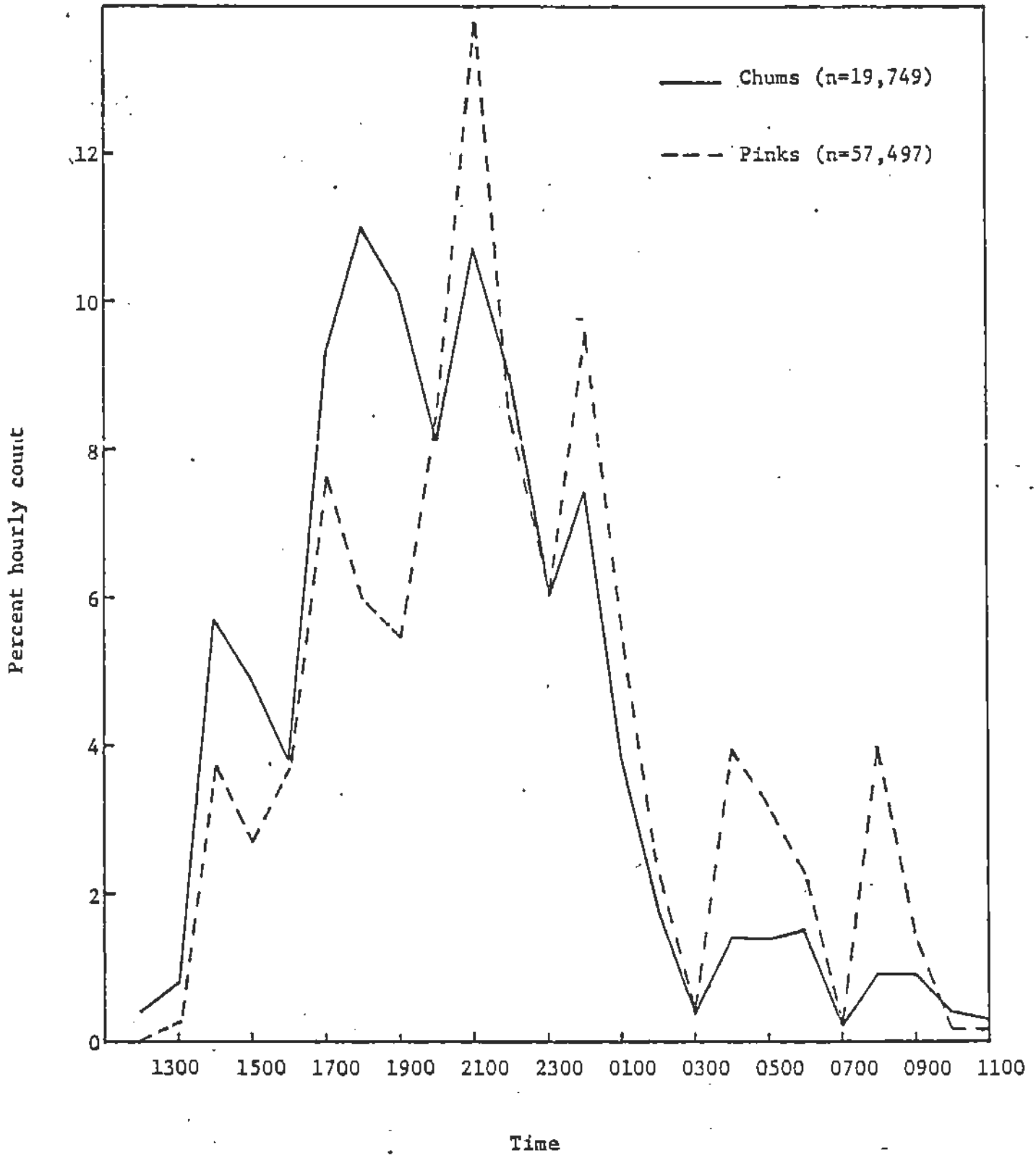
Species	Tower count[1/] Number	Tower count[1/] Percent sub total	Tower count[1/] Percent total	Aerial survey estimate[2/] Number	Aerial survey estimate[2/] Percent sub total	Aerial survey estimate[2/] Percent total
Chums	10,568	54.9	54.9	8,567	63.2	46.2
Pinks	8,683	45.1	45.1	4,990	36.8	26.0
Kings	12	<0.1	<0.1	2	<0.1	<0.1
Sub total	19,263	100.0		13,559	100.0	
Unidentified[3/]	--		--	4,965		26.8
Total	19,263		100.0	18,524		100.0

1/ Cumulative enumeration up to and including 7/8/69.

2/ Conducted 7/9/69.

3/ Includes both small chum and pink salmon.

Figure 7. Hourly migration patterns of chum and pink salmon, Kwiniuk River, 1969.



With the Kwiniuk River tower project becoming more and more useful toward management of the salmon fisheries, it is planned to utilize only management funds for this project in 1970, and to channel previously allocated Federal research monies to Yukon River programs. The required project completion report will be presented at a later date upon final analysis of the 1965-1969 data.

SUMMARY

1. For the fifth consecutive year, a counting tower project on the Kwiniuk River, a typical Norton Sound stream, was operated primarily for the purpose of obtaining the daily and seasonal timing and magnitude of the salmon runs which can be generally applied toward management of the Norton Sound fisheries.
2. A total of 19,749 chum, 57,497 pink and 12 king salmon was counted past the tower in 1969. The peak of the chum run occurred on July 3-9 while the pink run peaked during the period of July 15-19.
3. Ten minute tower counts per hour did not provide an acceptable estimate of total season escapement of chum and pink salmon in 1969 when compared to the total hourly counts.
4. An aerial survey estimate was 96.2 percent of the accumulated tower count escapement for a selected time period.
5. In 1969, water levels of the Kwiniuk River were generally low and clear, allowing for excellent observing conditions. Similar to previous years, salmon passing the tower traveled mainly during the mid-afternoon to early morning hours.
6. Two 400 watt incandescent light bulbs, operated by a portable generator, enhanced counting during dark or cloudy nights.

APPENDIX F

Daily chum and pink salmon escapements, Kwiniuk River, 1969.

Date	Chums	Pinks	Kings
6/26	57	17	1
27	56	2	0
28	314	22	2
29	144	11	1
30	904	65	2
7/ 1	582	14	0
2	687	101	0
3	1,117	146	0
4	2,195	787	5
5	1,081	1,094	0
6	970	1,715	1
7	1,407	2,441	0
8	1,054	2,268	0
9	1,159	2,723	0
10	470	1,278	0
11	380	855	0
12	623	1,908	0
13	998	2,803	0
14	681	1,129	0
15	1,178	5,677	0
16	307	2,794	0
17	753	7,013	0
18	1,228	2,977	0
19	362	6,057	0
20	211	3,729	0
21	315	4,317	0
22	140	2,234	0
23	17	595	0
23	135	969	0
25	29	476	0
26	195	1,280	0
Total	19,749	57,497	12
Catch above tower	-62	-814	-
Escapement	19,687	56,683	12